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Biocontrol of the Glassy-Winged Sharpshooter *Homalodisca vitripennis* (Hemiptera: Cicadellidae) in French Polynesia

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The glassy-winged sharpshooter (GWSS) *Homalodisca vitripennis* Germar (Hemiptera: Cicadellidae) is a major pest of agricultural, ornamental, and native plants because of its ability to transmit a lethal xylem-dwelling plant pathogenic bacterium, *Xylella fastidiosa*. It has proven to be a highly invasive insect with an ability to achieve incredible population densities in new areas when dislocated from its suite of natural enemies. This pest is native to the southeastern United States and northeastern Mexico. It invaded California in the late 1980's, Tahiti (French Polynesia) in 1999, Hawaii in 2004 and Easter Island (Chile) in 2005. Unparasitized egg masses on the undersides of leaves or small flightless nymphs on plants are mostly likely the inoculative propagule from one region to the other.

In French Polynesia, GWSS reproduced and spread very rapidly and is currently found in almost all islands in the Society Island group (Tahiti [invaded in 1999], Moorea [2002], Tahaa, Raiatea, Huahine, Bora Bora, Maupiti [2001-2005]) and has also been recorded in Nuku Hiva in the Marquesas (2004) and in Tubuai and Rurutu in the Australs (both 2005). In 2005, Tahiti and Moorea were the most heavily infested islands, where GWSS populations had reached densities far exceeding those observed in California or in its native range. High GWSS densities were a major annoyance for people in French Polynesia because feeding adults and nymphs produced astonishingly high quantities of watery excreta that 'rains' from heavily infested trees. Such high and continuous removal of xylem fluids had a detrimental impact on many plant species as well. But the major concern for French Polynesia was the possibility that this pest could acquire and vector *X. fastidiosa*. Finally, the immense propagule pressure emanating from French Polynesia represented a major invasion threat to other South Pacific countries.

In 2004, a classical biocontrol program against GWSS was conducted using the egg mymarid parasitoid *Gonatocerus ashmeadi* Girault (Hymenoptera: Mymaridae). This biological control program was initiated by the University of California (Berkeley and Riverside) via the Richard B. Gump South Pacific Research Station on Moorea, in collaboration with the French Polynesian Agricultural Service.

A risk assessment study on native cicadellids was conducted before the introduction of *G. ashmeadi* in French Polynesia. An inventory of native cicadellids species has been done and the *a priori* risk for those species appeared to be low based on phylogenetic, morphological and ecological criteria. The French Polynesia Government considered that the benefits of controlling *H. vitripennis* outweighed possible negative ecological impacts on native species and decided releases of *G. ashmeadi* should be initiated in May 2005. A total of 13,786 parasitoids has been released in 27 sites located all around the island of Tahiti between May and October 2005.

The impact of *G. ashmeadi* on GWSS was extremely rapid and catastrophic. By October 2005, the parasitoid had completely colonized Tahiti (including non-release control sites) and was even found in the mountains at elevations of 1400m. Parasitism of GWSS egg masses has averaged 80-100% in Tahiti since the introduction of the parasitoid, and populations of GWSS nymphs and adults have decreased by more than 90% since December 2005. Prior to parasitoid release, GWSS densities on Tahiti were averaging around 100 to 240 nymphs being collected in a sweep net per minute of sampling effort. After the parasitoid release, the number of GWSS nymphs has been maintained at a very low level with less than 3 nymphs per site on average. Populations *H. vitripennis* have been successfully maintained at this low level for more than one year. Population monitoring continues in order to determine if a stable equilibrium between the pest and the parasitoid has been reached.

The dispersal of G. ashmeadi among French Polynesia was extremely rapid as well. Its natural dispersal on the field has been estimated being 10-12 km/yr, but human mediation considerably speeded up the dispersal process inside the island of Tahiti, and from Tahiti to other islands of French Polynesia. *G. ashmeadi* colonized the 9 other islands infested by GWSS, through human plant transportation without any official releases. It has been detected in Moorea 4 months after its first release in Tahiti. It spread also in every Leeward Islands (4 to 7 months after its first introduction in Tahiti), in Rurutu and Tubuai in Australs (after 7 months), in Nuku Hiva (after 8 months) and in Easter island (after 10 months).